while inverter **3** is powered by a suitable supply voltage. Examples of suitable switching frequencies and supply voltages are discussed below. However, the network **6** and/or the transmit coil **10** need not be energized by switching the inverter at a switching frequency. To increase the energy stored, a voltage may be applied across a capacitor of the matching network **6** to increase the energy stored in the capacitor, a current may be applied to the transmit coil **10** which may increase the energy stored in its inductance, or the energy stored in both may be increased. In some embodiments, when the wireless power transmitter is energized in the foreign object detection mode it is energized at a lower level than when in the wireless power transmitter is in the power transmission mode. A lower voltage and/or current may be applied to the matching network **6** and/or the transmit coil **10** as compared to the voltage and/or current applied in the power transmission mode, which can limit the power consumed for foreign object detection.

[0035] The resonance may be excited by switching one or more switches of the inverter **3** into a state that causes a capacitor of the matching network **6** to resonate with the inductance of the transmit coil **10**. For example, the inverter may be switched at a suitable switching frequency. When the resonance is excited the capacitor of the matching network **6** exchanges energy with the inductance of the transmit coil **10** at the resonant frequency.

[0036] In step S**2**, the resonance between the matching network and transmit coil is allowed to decay. Energy transfer into matching network and transmit coil may be inhibited in step S**2**, so that the matching network and transmit coil can resonate freely without the addition of energy. As an example, if step S**1** includes switching the inverter **3** at a switching frequency, the switching may be stopped in step S**2**, and the inverter kept in a state that does not allow energy to flow into the matching network or transmit coil. For example, the output of the inverter may be held in a low impedance state. The output voltage may be held constant at a fixed voltage (e.g., a common mode voltage such as ground, or VDC) by turning on the appropriate transistor(s) of the inverter. The resonance is allowed to decay freely. If a foreign conductive object **20** is present in the field produced by transmit coil **10**, eddy currents are induced in the object **20** which loads the resonant network formed by the matching network **6** and transmit coil **10**, causing the resonance to decay more rapidly than if no foreign object is present. Accordingly, the speed of decay of the resonance is indicative of whether a foreign conductive object **20** is present.

[0037] In step S**3**, a temporal characteristic of the resonance decay may be measured. As should be appreciated, step S**3** may be performed at least partially at the same time as step S**2**. To measure a temporal characteristic of the resonance decay, one or more measurements of the matching network **6** and/or transmit coil **10** may be made to detect how quickly the resonance changes. The measurement(s) may be made by controller **5**, which may include suitable measurement circuitry, or a separate measurement circuit. Any suitable parameters may be measured, such as the current or voltage, for example. As shown by the dashed lines in FIG. **1**, the measurement(s) may be made at the matching network **6** and/or the transmit coil **10**.

[0038] In some embodiments, the decay may be exponential, and the speed of the decay may be represented by a time constant. Determining the temporal characteristic may include measuring a time constant or a value indicative thereof. In some embodiments, the temporal characteristic may be determined by calculating a ratio of the currents or voltages as they decay over time.

[0039] In step S**4**, the temporal characteristic may be analyzed to determine whether it is indicative of the presence of a foreign object. In some embodiments, the quality factor Q of the wireless power transmitter **1** may be determined based on the temporal characteristic and/or the measurements themselves. As an example of the analysis that may be performed in step S**4**, the temporal characteristic or quality factor Q may be compared to data indicating expected temporal factors or quality factors Q. For example the wireless power transmitter **1** may store data (e.g., in non-volatile memory) representing quality factors Q of known wireless power receivers. The quality factor Q determined from the measured temporal characteristic may be compared with the stored data, and if it differs from the expected value(s) by more than a threshold amount the measured quality factor may be indicative of the presence of a foreign conductive object **20**. As another example, the wireless power transmitter **1** may receive data from the wireless power receiver **11** indicating the quality factor Q of the wireless power receiver **11**. The quality factor Q determined from the measured temporal characteristic may be compared with the received quality factor Q of the receiver, and if it differs from that of the receiver by more than a threshold amount the measured quality factor may be indicative of the presence of a foreign conductive object **20**.

[0040] In step S**5**, wireless power transmission by the wireless power transmitter **1** may be enabled or inhibited based on the result of the analysis. If the measured temporal parameter or quality factor Q is outside of an acceptable range, wireless power transmission may be inhibited. If the measured decay is within an acceptable range, power transmission may be enabled, and the wireless power transmitter **1** may be allowed to enter the power transmission mode. The quality factor Q considered acceptable may be based on quality factor provided by a wireless power receiver to the wireless power transmitter via in-band or out-of-band communication

[0041] FIGS. **3**A-**3**C show examples of drive circuit **7** implemented as class D amplifiers. FIGS. **3**A and **3**B show a single ended (half-bridge) configuration in which inverter **3** is implemented by transistors Q**1** and Q**2**, matching network **6** is implemented by capacitor C_{RES}. Transmit coil **10** is represented by inductor L_{RES} and an equivalent series resistance (ESR). FIG. **3**C shows a differential (full-bridge) configuration in which inverter **3** is implemented by transistors Q**1**-Q**4**, matching network **6** is implemented by capacitors C_{RES1}, C_{RES2} and C_{RES3}. The drive circuit **7** is powered by a DC supply voltage VDC. FIGS. **4**A-**4**C show examples of drive circuit **7** implemented as class E amplifiers.

[0042] FIG. **5** shows an example of wireless power reception circuitry for a wireless power receiver **11**. Matching network **13** is implemented by a capacitor C_{RES}. Rectifier **14** is implemented by a full-bridge diode rectifier with an output filter capacitor Crec having a voltage Vrec across it. DC/DC converter **15** is implemented by a post regulator/load switch that produces V_{out}.

[0043] Having shown examples of drive circuit **7** and an example of wireless power reception circuitry for a wireless